NOTES ON THE FLOWERING AND LIFE HISTORY OF *NEUROLEPIS PITTIERI* (GRAMINEAE, BAMBUSOIDEAE)

The flowering and fruiting of bamboos has always attracted the attention of botanists and other interested observers because many species exhibit synchronous flowering and fruiting, followed by the death of the parent plants and re-establishment of the population from seedlings. Such life cycles may vary from 3–120 years, depending on the species (Janzen, 1976). Both McClure (1966) and Janzen (1976) in reviews of the reproductive behavior of bamboos stressed the need for detailed observations through several cycles from known populations in order to obtain accurate life histories of these plants.

Although the following notes on *Neurolepis pittieri* McClure are very fragmentary, we feel that they are important initial observations on the life history of this fascinating bamboo. More importantly, we hope it arouses the interest of persons better placed to make the necessary long-term observations needed to fully understand its life history.

Neurolepis pittieri has been reported to be endemic to the state of Aragua, Venezuela (Soderstrom, 1969), but more recent collections determined by Soderstrom extend the range of the species to Pico Phelps in southernmost Venezuela and Cerro Hornito, Chiriquí, Panama, the first Central American record for the genus. The population on which the present observations were made occurs in the Parque Nacional Henri Pittier (Rancho Grande), coastal cordillera, Aragua. It grows in cloud forest along a well-established trail at the place known as Cumbre de Rancho Grande at 1,450 m. It forms, at least locally, the dominant element of the herbaceous understory of the cloud forest.

Because of its greatly elongated blades and unbranched (above the base) culms, it is one of the most grasslike of the bamboos in general aspect (Fig. 1). Including its long blades, the plants grow 1–3 m tall vegetatively. When flowering, only single terminal inflorescences are produced on each culm, making the plants up to 4 m tall.

Huber observed the synchronous flowering of this population 12 July 1978 [*Huber 2162* (MO, VEN)]. Davidse, Huber, and B. Rollet (FAO) visited the population 17 April 1979 [*Davidse, Huber & Rollet 16634* (MO, VEN)]. At this time we observed only four mature flowering plants, from an original population estimated to consist of more than 100 plants. This last remnant of the 1978 flowering population probably represented plants that flowered slightly out of sequence compared to the majority of the other plants. One of the four was senescent and obviously ready to die. All of the other plants observed to be flowering in 1978 had died and for most of them only the remains of the rhizomes and sometimes a short portion of a culm could be seen. Close examination showed these rhizome systems to be completely dead, but, because of their greater woodiness, the rhizomes were decaying more slowly than the inflorescences, leaves, and upper portions of the culms. A few plants with the entire flowering culms still intact, but completely dead, were also observed. Seedlings abounded everywhere, ranging in size from recently germinated plantlets just a few centimeters

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FIGURE 1. Vegetative plant of *Neurolepis pittieri* in cloud forest in Parque Nacional Henri Pittier (Rancho Grande), Venezuela. Rod used as a scale is 2 m long.

tall to well-established plants 50–60 cm tall. Previously, Pittier, cited by McClure (1942: 183), had already noted that plants from the type locality between Colonia Tovar and El Lagunazo, also in the coastal cordillera in Aragua, died upon flowering; however, no other observations were recorded by him. Similar observations have been made on the Panamanian population (B. Hammel, pers. comm.). Flowering was first observed on 27 December 1977 [*Folsom, Dressler & Channell 7242* (MO)] and was later observed to approach its peak during March by Dressler. The population was revisited on 15 February 1979 [*Hammel 6207* (MO)] at which time a few plants were still in flower but most had died. Numerous seedlings had become established.

All observations demonstrate that this species flowers and fruits synchronously, dies, and regenerates itself from seed. How closely various populations

throughout the range of the species may be synchronized in their flowering is impossible to tell presently with our current meager data.

Just how long the entire life cycle may be cannot be stated conclusively, but we have incomplete data that it may be five years. This is deduced from the following facts. Huber and P. Berry (Missouri Botanical Garden) observed the Rancho Grande plants 30 August 1975. Most of the plants were vegetative, but a few old flowering plants were seen and a voucher was collected [*Berry 1161* (MO)]. This stage presumably represented one somewhat later than that observed in 1979. Apparently, in 1975 a few plants also flowered later than the majority of the plants in the population, and the vegetative plants probably represented vigorous young plants, at least several months older than the seedlings observed in 1979. Further observations by Huber in October 1975, January 1976 (Fig. 1), and October 1976, showed only vegetative plants. No further observations were made until flowering took place in July 1978, but it is assumed that the entire population remained vegetative during the intervening time.

Because *Neurolepis pittieri* in Rancho Grande is in an undisturbed, well-protected environment, is easily accessible, and apparently has a relatively short life cycle (for bamboos), it is hoped that complete observations of its life history and its interactions with other organisms can be made in the future. This could be a good test case for the predator satiation hypothesis proposed by Janzen (1976).

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A NEW SPECIES OF *ALIBERTIA* (RUBIACEAE) FROM VENEZUELA

During the years 1977 and 1978, the Missouri Botanical Garden has collaborated with the Instituto Botánico of the Ministerio del Ambiente y de los Recursos Naturales Renovables of Venezuela in a joint program of botanical exploration to areas endangered by dam projects, drainage and river canalization plans, deforestation and agricultural activities, and other undertakings, all leading to drastic changes and destruction of the natural environment.

In a suite of Rubiaceae obtained from the Estado Apure of southwestern

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